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WORLD SCANNER REPORT

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Also in keeping with tradition, if your budget is strained and you can't afford to renew right away, just tell us, and we'll make sure you get one more issue on time while you're getting things settled.

GETTING CAUGHT UP

This is the last issue of Vol-5, slightly late and out of kilter with the *desired* mailing schedule. We were thrown off track months ago, thanks to health problems and a rush of business matters that required keen attention. Things have settled back into a dull roar now, and the health hasn't gotten worse. We should be able to get back on track at a rate of about one issue per month.

I have a series of medical tests and evaluations starting March 1, and there is no telling how that will impact my schedule, but I don't foresee anything to put a screeching halt to our operations. We have a substantial backlog of material for you, to cover several issues, even if I never hit another key, so prospects look good from all angles.

You can relax because subscriptions are guaranteed several ways, the first of which is you cancel at any time for a pro-rated refund of ***unsent issues***, and two, whether or not we're on time, each subscription is guaranteed the proper number of issues before expiration.

FUTURE DIRECTIONS
~ An Editorial ~

Would you believe we've run out of things to write about? No? Well, good, because we haven't. But we are facing a big uncertainty of ***what*** to write about. And you can help. ***You have to help.***

This magazine is for you, but I'm no longer sure of what **you** want. The face of scanning is changing, and the ***WSR*** is going to become an anachronism in another year or so *unless* I do something about it now. We have to shift gears and directions a little and ***you*** have to tell me where to go. But first, read on and get a feel for what we're facing ahead.

Scanner hacking and re-engineering, *our prime focus*, began in Sept, 1986, when I got a brand spanking new PRO-2004 and probed its innards for some way to liberate the cellular bands that had been deliberately blocked just before release. (*If you check the RS 1987 catalog, you'll see where it advertises **continuous coverage** from 760-1300 MHz.*) It was **supposed to be** continuous coverage, too, but pressure from industry and government forced a last-minute decision from Radio Shack to block the coverage. (*I knew it had to be restorable.*)

I knew, because in 1982, I found some diodes to clip or add in my PRO-2002 that "*restored*" the "*non-existent*" government band of 380-420 MHz! I also found that 806-900 MHz could be made to appear in the display, though reception was not possible due to RF design cutoff at 512 MHz.

I didn't tell anyone then of my curious discoveries, because there was no forum to tell and there seemed only a passing interest in scanners and scanning at that time. There certainly was little or no interest in scanner hacking anyway. Besides, the rave was ***Citizen's Band*** and scanners were only incidental. I never really gave much thought to the uniqueness of my PRO-2002. I liked it, but few of my visitors ever gave it a second glance or asked about it.

The PRO-2004 was quite the different story in Sept-86, as word spread of its cellular capability. At least several people independently "discovered" the retrofitted blocking diode. Our published instructions to ease the restoration for all users helped fuel the fires of hacking.

And lo! The diode switch matrix of the PRO-2004 just begged for exploration and mining, and gold was found, almost simultaneously by yours truly and several others. The PRO-2004 yielded up 100 extra channels and a 25% speed increase, just for adding a couple of diodes! *The rage was on.....*

Several other scanners gave up interesting "secrets" so the hobby magazines of the times were loaded with exciting discoveries. By 1991, the scanner market had grown by leaps and bounds. The PRO-2004 had evolved into the PRO-2006 that reigned supreme for four years until it was officially discontinued in 1994.

The TDDRA Act of 1994 closed the door to the exciting domain of hacking by forbidding "*easily cellular modified*" scanners. The new PRO-2035 and now the PRO-2042, while definitely retaining much of the successful PRO-2004/5/6 design, failed to generate any excitement in the scanner community. Cellular access was over, and so it seemed, other easily performed hacks.

That's were we sit today. The present crop of scanners are not capable of much in the way of improvement, though the PRO-2035, PRO-2042, PRO-43, PRO-26, and PRO-60 all offer slight possibilities to those willing to work for slight gains. Uniden scanners are typically the same as ever...***blah***, if they don't come with what you want.

Uniden clearly offers a decent scanner or two, as do AOR and Trident, but good grief, the costs! Optoelectronics offers some potentially exciting add-ons for the

AR-8000 and other scanners, but again, the costs! Sky-high!

In a word, slowly but surely, we are being forced to buy ready-made stuff to meet our heart's fondest desires. No, we're not done hacking yet, but the handwriting is on the wall. The faces of scanners and scanning are changing.

Yes, scanning is changing, too. First, the ***people*** are changing. Several years ago, scannists were a healthy mix of middle and upper class people with professional and technical backgrounds. The growth of the scanning hobby brought in waves of some very low class people, including drug peddlers and other riffraff from all walks of life. The people of scanning are no longer the unified, close-knit community of several years ago. The good guys are still here, but so are "bad guys": people with no regard for truth; ethics; and character.

The scanning ***process*** is changing. See, trunked radio systems are the rave of every community. Trunked radio systems have been around for the better part of ten years, but the means of following a trunked conversation hasn't changed a lick. It can't change. ***Law*** won't allow it. You see, the computer software that controls trunked radio systems, typically from Motorola, GE, and E.F. Johnson, is proprietary and copyrighted. It is not possible for scanners to "follow" trunked communications for at least two reasons:

1. The software is proprietary and not released to the public. It is also encoded and therefore not decipherable. Scanner mfgrs couldn't make a trunked follower scanner if they wanted to.
2. It is illegal to detect and decode radio transmissions not intended for the general public (ECPA of 1986)

More and more radio communications will be moving to the trunked concept in the coming years. Scanning them will be a lot less fun. When pursuits are not fun, people bail out. When people bail out, markets shrink. ***Remember that.***

We all know that cellular comms is moving to digital format, which will eliminate any further possibility of monitoring there. When that digital technology is proven and established, many other radio services will move into the digital realm. Even if they don't use proprietary methods, it will be tough or not fun to scan these signals, except in special case situations. In a word, plain voice communications is rapidly headed to oblivion. I'm sure some public services like NOAA weather broadcasts will remain in plain voice for a while, so we can always listen to them, I guess. ☹

Oh, and digital signals can be encrypted with a $50 module that defies most reasonable attempts at decryption. Everything will be encrypted one of these days. *That NOAA weather broadcast is starting to look pretty good, huh?*

Back to the ***people***....the last 8 years of exciting hack adventures spawned an urban legend that all scanners can be hacked into firebreathing turbowhoppers, as evidenced by hundreds of questions all over the networked computer forums, something to the effect"

"What mods are available for my SnakeBite XR-65 handheld scanner? It has ten channels and covers 30-138 and 400-512 MHz. I want 2000 channels and complete coverage from 1 MHz to 2 GHz with SSB."

Yeah, rrr-i-i-i-ght, pal. You guys think I am joking? I'm not. These people have heard the urban legend, and they ***know***! The mere act of telling them its not possible angers many and deflates others.

Now get this: Chuck Gysi, the new editor of "*Popular Communications*" says in part, in the January '96 issue, in response to a reader lamenting his loss of interest in radio:

"..... a very interesting question that paused me to stop and think, too. Like, when was the last time I operated on HF, when was the last time I ragchewed on VHF or UHF, or when I last actually sat down for more than five minutes in front of any radio! Well, I find myself behind the computer(s) for many hours of every day. And I am doing e-mail, writing World Wide Web pages on the Internet, cruising newsgroups, etc. And with things like Iphone on the market now, I suppose it won't be long before I am chatting via voice on the Internet, too! Scary thought ... maybe I really don't need that antenna farm out in the back 40 anymore."

Gysi may have taken a stab at humor, but believe me, he was as serious as a heart attack, whether he knew it or not.

The deep implications of what he may have meant are painfully clear to me. We are spending more time at our computers having as much or more fun than at the radios; and otherwise doing the same things as we do with radio! Mr. Gysi may not have expressly meant it, but the fact is, most everything done with a radio can be done with a computer easier, cheaper, and quite possibly with more fun and certainly with a greater efficiency.

Oh, sure, there are exceptions. I am talking about the rule..... No, there is no substitute for catching a ship in trouble on the high seas, or snagging an elusive shortwave broadcast from Outer Mongolia; or listing to the cops and robbers in action. Trouble is, ships at sea have more effective means of announcing emergencies now. Outer Mongolia's need to use shortwave radio for entertainment and propaganda is drawing to a close; and the cops and robbers will soon both be encrypted. ***Now do you see my concerns?***

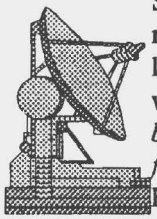
Otherwise, we can do most everything else from our computers over the Internet and other networked comm routes. Fun? Yer dern tootin', it's fun, especially when you can save, process, retrieve and use information acquired from networked sources; quite difficult to efficiently do with a radio signal squeaking through the noise, and when the kids cobbed your last cassette tape.

Radio is changing with the times. Sure, there will be a few hobby aspects of it that will last for a long time; like DXing your favorite NOAA weather station; perhaps digging out some neat fax signals from satellites; maybe some radio astronomy; SETI, shuttle broadcasts, and things like that. I'm talking specialized aspects of monitoring that will survive the times for a while. If you can go specialized, then great! But the days of listening to cops, robbers, fire engines, taxis, drug deals, railroads, military, and even aeronautical communications are rapidly coming to a crossroads from which nothing will ever be the same.

So what now? Ladies and gentlemen: fire up your newfangled computing machines. Whatever there is left of radio is going to involve computers, more and more, to either get the comms in the first place, or at least to enhance and simplify the process of monitoring. Or, at the very least, offer a means of staying on top of all the coming changes by putting you in touch with many other scannists.

Now let me hear from you with ideas or suggestions of where you want the ***WSR*** to go for the near and mid-term future.

THE IDEAL SCANNER



Someone on the Internet recently said Uniden was looking for what consumers wanted in a scanner. *(I'll bet...Uniden doesn't care for what people want....).* But, in the offhand chance, the message was serious, I posted a list of fifty things I want in a scanner. Now you guys tell me if I left anything out. Will Uniden listen?

1 AGC-controlled front end and IF stages
2 Alphameric storage; per channel
3 Attenuator; front-end electronic; programmable
4 Bandpass filtered front end: 7-filters minimum to cover 25-1300 MHz; minimum.
5 Baseband audio output (line level; unfiltered)
6 Beep; adjustable
7 Carrier Operated Relay (contact closure output)
8 Computer Interface; EIA-232 or open design; 19.2+kBps; 2-way control & data acquisition
9 Computer Interface port; infrared;19.2+kBps; 2-way control & data acquisition
10 Computer software for 2-way interface; BASIC source code provided
11 Data/Tone Squelch; reject non-voice signals
12 Decoder; CTCSS
13 Decoder; DTMF
14 Decoder; Tone; user adjustable, 300 Hz - 6 kHz
15 Delay; adjustable; programmable; 0-15 sec
16 Discrete components; minimal LSI
17 Display lighting; indiglo; time delay/continuous
18 Double balanced mixers
19 Duplicate entry detector
20 Event counter; per channel
21 Event Log in Buffer Memory; w/computer dump
22 Filtered IF sections
23 Fine-tuning; adj; analog or digital in 10 Hz steps
24 GaAsFET low noise front end for VHF & up
25 Human engineered
26 IF bandwidth; programmable: 5 kHz; 7.5 kHz; 10 kHz; 15 kHz; 25 kHz; 50 kHz; 100 kHz; 200 kHz
27 Keyboard; affirmative action; large keys
28 LockOut Reviewer
29 Manual Up/Down
30 Metering; Center Tuning; analog or 7-seg
31 Metering; Signal Level; analog or 20-seg digital; am/nfm/wfm
32 Mode settings; User selectable: AM; NFM; WFM; SSB
33 Multiple antenna ports; keyed to bandpass filter ranges; programmable
34 NOAA weather radio alert
35 Program Organizer; by freq; by alphameric codes; by mode; etc
36 Programmable channels; 200 to 1000
37 Reject undesired bands from program memory
38 Reject undesired freqs from program memory
39 Scan Banks; 50 or more
40 Scan: Up/Down
41 Search & Store function with special store banks
42 Search Banks; 10 or more
43 Search from any frequency in the display; direct search up or down
44 Search increments; User selectable: 2.5 kHz; 5 kHz; 10 kHz; 12.5 kHz; 30 kHz; 50 kHz
45 Search Limits, definable; Up/Down
46 Sensitivity: 0.25-uV @ 10 dB S+N/N
47 Sound Squelch; reject dead carriers
48 Speed: 50-100 ch/sec
49 Tape Record audio out (line level; voice band)
50 Triple up conversion

MICROSOFT WINDOWS 95 STILL GOING STRONG

and no serious bugs have surfaced! *Win95* is here to stay and growing with the times. *Win95* is ideal for the hacker/hobbyist! ☺

BIG BROTHER'S BIG EARS

(Reprinted by permission of the author)
Foreign Correspondent
Inside Track On World News
International Syndicated Columnist & Broadcaster
Eric Margolis <emargolis@lglobal.com>

BIG BROTHER'S BIG EARS
by Eric Margolis 16 Nov 95

There was outrage this week to charges that a top secret Ottawa spy agency was eavesdropping on communications of Canadian citizens, as well as on those of friendly nations. This reminds me of Henry Stimson's famous remark about espionage.

When creation of an American spy agency was proposed to Secretary of War Stimson in the late 1930's, he sniffed, ***"gentlemen do not read one another's mail!"***

Modern states have no such scruples. All modern industrial powers maintain electronic intelligence(ELINT) operations that listen in to phone, fax, telex and modem transmissions going in or out of their territories.

In Canada, the Communications Security Establishment (CSE) routinely monitors comms of embassies in Ottawa, as well as international traffic. Charges by a former CSE employee that the agency listened in to trade talks with Mexico and South Korea are perfectly plausible, if sharply embarrassing. So, unfortunately, are charges that CSE's big ears also picked up conversations by Canadian citizens.

Doing the latter is quite illegal. Yet it's also unavoidable. Modern ELINT technology hovers up vast amounts of electronic data across a wide frequency spectrum. The data stream is then sifted and analyzed. Inevitably, private conversations get sucked into the system. This is particularly true of investigations into terrorism, money laundering, and other international criminal activities.

The world's largest ELINT system, America's National Security Agency, monitors worldwide transmissions. Some are specifically targeted; others randomly scanned, using key "buzz" words that activate surveillance. NSA's big ears also pick up "private" communications of American and Canadian citizens.

Much of this information avalanche remains crude data. Neither NSA or CSE has the time, manpower or money to listen in to everything. The only agency that did was the KGB, during the golden days of the Soviet Union.

Random security sampling of communications inevitably leads to problems. Earlier this year, it was revealed that one of Spain's security service had monitored the calls of King Juan Carlos. Britain's MI5 taped calls by members of the royal family, including notably silly drivel by the Prince, sure CSE has the prime minister and all Quebec separatists on tape.

That, unfortunately, is the nature of our increasingly transparent electronic world. The more communications improve, the less secure they become. A citizen's right to private communications can no longer be guaranteed. Technology has overtaken law.

At the same time, the Cold War's end left too many spies with too little work. Many agencies accordingly switched to commercial spying. France's spy agency, DGSE, was accused of bugging first class seats on Air France. Last spring, France charged five CIA agents with industrial espionage, something the French are very good at themselves. Russia, Israel and China have saved hundreds of millions in R&D by stealing American military and civilian technology. Now, to the thunder of anguished "eeks," it turns out that even squeaky-clean Canada may not be above a little commercial eavesdropping.

I suspect that another big ELINT scandal may soon erupt, probably in Washington. NSA's big ears pick up streams of highly sensitive business data that gives its analysts advance knowledge of movements on the commodity, currency and stock markets.

Might NSA play the markets to generate "special" operating funds? Or the CIA, or the US government, for that matter? The temptation for modestly-paid government employees to sell business information to outside speculators must be strong. Nor are cash-strapped government agencies above temptation. This column believes some "black" projects and deep-cover operations may have long been financed by secret government speculation on world financial markets.

More "hear no evil" legislation probably won't work. Unless you have high-tech encryption gear, assume all electronic communications are compromised.

In spite of all our electronic wizardry, whispering remains the safest form of communication. -Eric Margolis

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TIME TO RENEW?

PROFESSOR PEABODY HACKS
EDITOR'S MOD-44

Greetings scanner fans!, this month we revisit a classic hack, Bill Cheek's ***Data Tone Squelch MOD-44*** that first appeared in the ***WSR V1N10*** issue. The ***DSQ*** is an answer to those annoying non-voice signals in the cellular, trunked, and other band segments of the spectrum. I built one and it worked, but it sometimes would hang. I felt it wasn't as good as it could have been.

But I left it alone until a friend asked me to optimize this circuit. I took a closer look at it and came up with an improvement that makes it *almost 100 percent reliable*. Now, I'm not criticizing Bill Cheek's design prowess at all and as many of you know I even improve and upgrade my own circuits as new info becomes available. So grab either the ***WSR V1N10,*** or Bill's new book, ***The Ultimate Scanner,*** where the DSQ is also presented, and lets take a walk down memory lane and revisit this old friend.

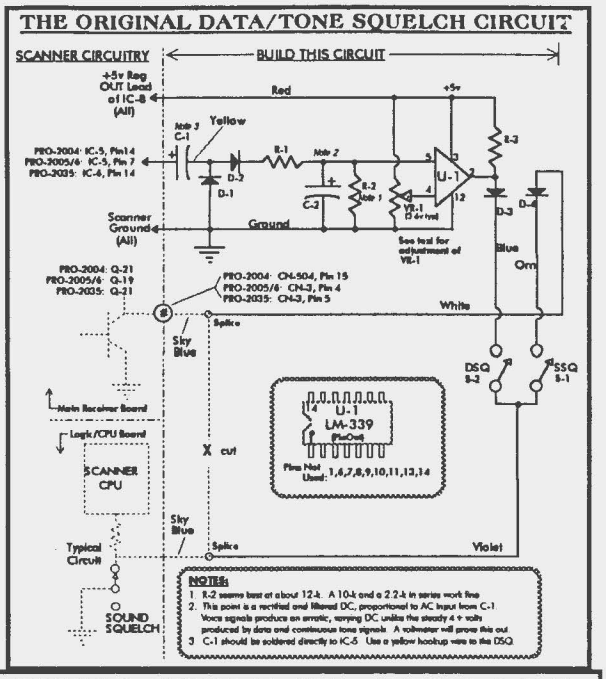
OVERVIEW: Our ***DSQ*** prevents the scanner from locking up on most non-voice signals, including computer control, pagers, IMTS tones; anti-scanner tones, DES/DVP encryption, cellular control, and most other obnoxious, annoying, continuous types of undesired signals. The scanner will momentarily pause on these signals, all right, but then pick right up and continue on with scanning or searching. Voice signals are treated normally.

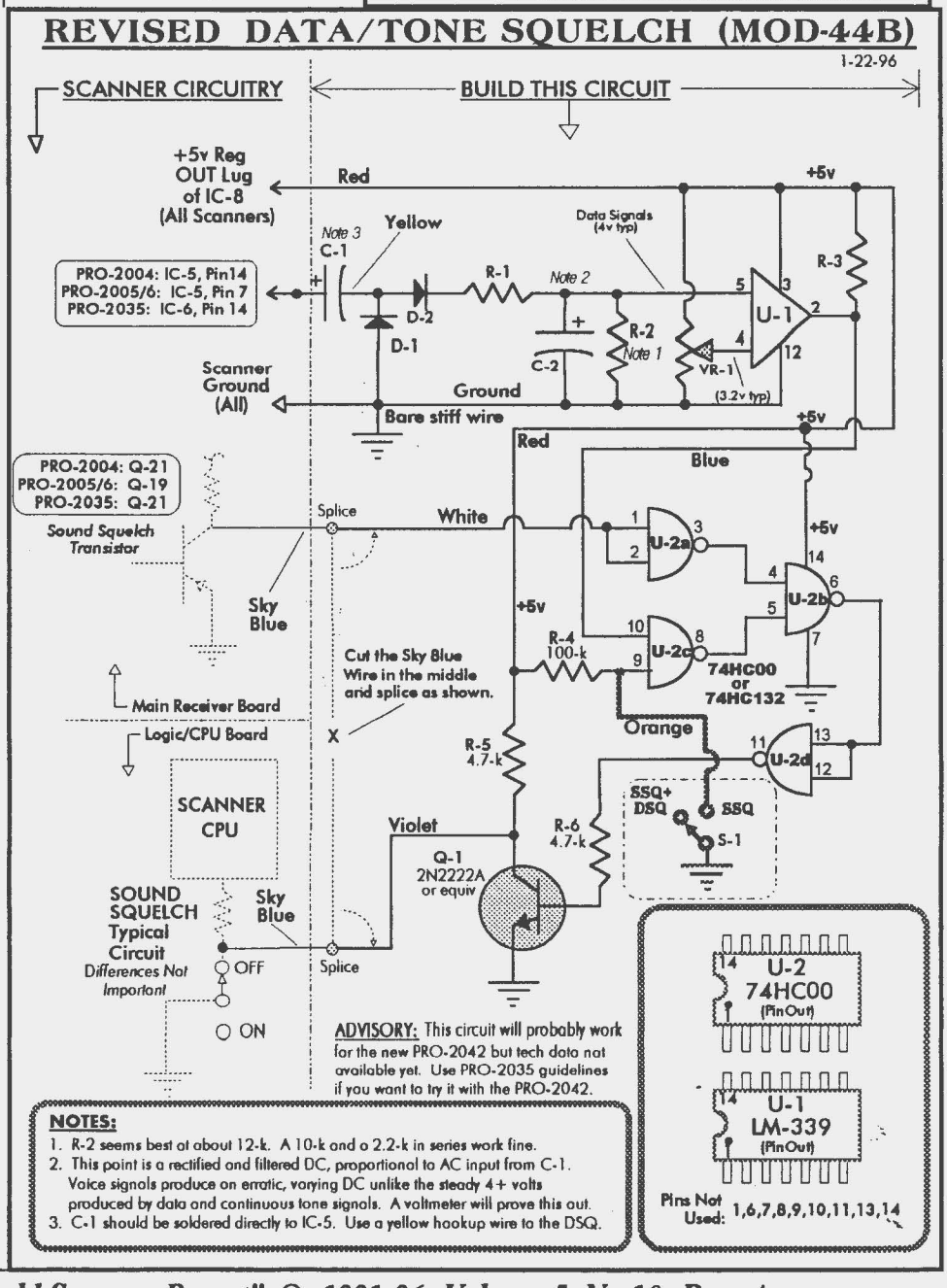
SOUND SQUELCH OVERVIEW: The scanner's schematic shows the output of the ***Sound Squelch (SSQ)*** transistor, Q19 or Q21, depending on which scanner you have, is a logic zero or +5v to the CPU. When ***Sound Squelch*** is OFF, the SSQ switch puts a ground or zero volts to the CPU SSQ pin. This tells it to operate normally and the scanner just does its usual thing. When the switch is open (SSQ-On), that signal can go up to a logic high to allow the scanner to make decisions over two conditions.

One is when the SQUELCH is open, the SSQ signal bounces up and down in time with the audio. This lets the CPU know that a signal is received that has audio in it and that the CPU should not skip this signal. Birdies and dead carriers, however, cause a constant logic high on this line which tells the CPU that ain't a valid signal is being received.

If this signal stays high, the CPU then decides whether to scan to next channel or skip to the next incremented freq in the search mode. This is the basic operation of the circuit and a very clever one at that.

CREATIVE JUICES FLOW: After gnawing on this and the DSQ circuits for a while I had a profound revelation. I realized that there can never be a situation with only the data squelch function enabled with no sound squelch. This is because logic circuits can only have 2 levels at their inputs that are valid. A high and a low. So the input to the CPU is armed and ready to do its





PARTS LIST FOR THE NEW DSQ CIRCUIT (MOD-44B)

CKT SYM	DESCRIPTION	RADIO SHACK #
C1	1-uF/35vdc Tantalum	#272-1434
C2	2.2-uF/35vdc Tantalum	#272-1435
D1-4	1N4148/1N914 diodes	#276-1122
Q1	Transistor 2N2222A	#276-2009
R1	390-Ω	#271-018
R2	*12-k; *10-kΩ 2.2kΩ*	*#271-1335*
	in series okay	#271-1325
R3	3.3-k Ω	#271-1328
R4	100-k Ω	#271-1347
R5-6	4.7-k Ω	#271-1330
U-1	LM-339 Comparator	#276-1712
U-2	*74HC00 Quad NAND	*
VR-1	10-k ohm trim pot	#271-282
XU1-2	IC Socket, 14-pin DIP	#276-1999
Misc	Perf board	#276-1395
S1	Switch, SPST Toggle	#275-624

* Not available at Radio Shack

decision thing with a logic high at the input. If the Data squelch is the only input to the CPU then only data tones will have an effect on the decision which will be to keep a logic high on the CPU pin and this will cause the CPU to skip over all valid voice signals along with data tones. So you effectively have no action whatsoever. Now if you keep the CPU pin low when you are trying to skip over data tones and the CPU pin goes high when a data tone signal is received the scanner will hang there for about 4 seconds before the signal is skipped.

This is the same as turning the SSQ switch on from off when a birdie is received. The scanner will wait for 4 seconds and then skip the signal. As you can see, the only way for the DSQ mod to work properly is in synergy with the SSQ circuit. That's why as some of you and myself have discovered that the original circuit with independent switching works the best with both options enabled.

The other problem I found is a subtle but profound effect which will also cause problems in this scenario of the independently switched circuit having both options enabled and a valid voice signal received, the output of the SSQ transistor is a logic low but is then fed to a diode. The output of the DSQ is also a low and it also goes through a diode. A diode needs some current to be flowing through it to turn it on but in this case 2 lows or grounds are put on both diodes and they are effectively turned off.

Basically they are not there! A float condition is now on the CPU pin of a voltage anywhere between 1to 3 volts. In the digital world this is called an indeterminate state and has to be avoided at all costs. A "float" condition can not guarantee proper decision-making and the result is a wishy washy operation.

OK, Prof, enough of this gobbledygook and lets see what's coming up on the instant replay. Referring to the revised DSQ circuit, notice that the diodes are gone. This ensures that valid logic signals are the only ones in play. The outputs of the SSQ and the DSQ circuits are fed to NAND gates A and C respectively, and then combined into gate B and inverted by gate D. This whole network of gates becomes a logic NOR gate for you techno-weenies.

I needed a way to enable the DSQ function so I used discrete gates instead of a real NOR gate. On pin 9 of gate C is a switch that will place a low or high on pin 9 and this will allow either SSQ only if the switch is closed or SSQ ***and*** DSQ if the switch is in the open position.

DSQ ANALYSIS: When a data or tone signal is detected by the DSQ circuit, a high appears on pin 2 of the voltage comparator and then appears on pin 10 of gate C. With pin 9 at a high state a logic low is now at pin 5 of gate B. This locks out the negative going signals from the SSQ circuit from being output at pin 6 and ultimately at pin 11 of gate D. The transistor hanging on the output of pin 11 is in the exact configuration as the original SSQ circuit. When a logic high outputs from pin 11 of gate D, it turns on the transistor and causes the collector to drop low from 5 volts.

When the DSQ puts a high at pin 10 of gate C a low comes out of pin 8. This causes a logic high to come out of pin 6 of gate B (*that's how NAND gates work.*) You need 2 highs at the input to get a low output. So out of pin 6 of gate B is a steady logic high which is inverted by gate D to a logic low. A logic low or ground at the base of the transistor prevents the transistor from being turned on, so a logic high on the collector passes to the CPU pin to cause the offending data tone to be skipped.

I tested this new circuit on the radio belonging to Ed Smith of Barstow California for a week straight and it worked magnificently on data tones of various services, skipping all of them, but holding on valid audio signals as it should.

The NAND gate chip can either be a 74HCOO or a 74HC132 as the pins are identical; the 132 being a Schmidt Trigger type for cleaner output signals. Either works fine.

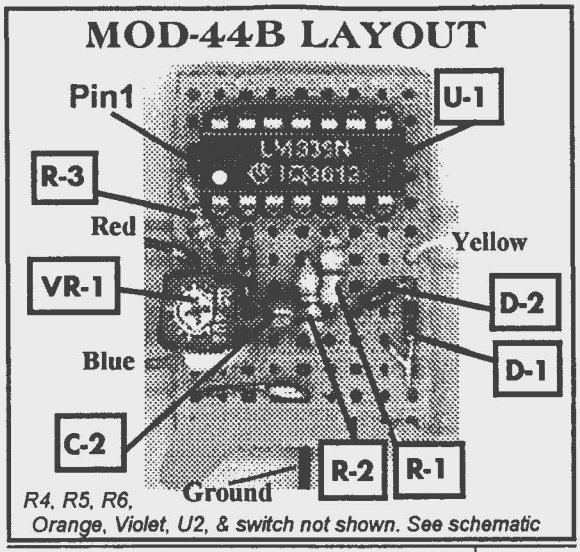
In the original alignment instructions for the DSQ it was stated that the set voltage at pin 4 of the voltage comparator should be in the 2 to 3.8 volt range. In practice I have found that a setting of about 2.3 volts yields the most reliable operation of the DSQ circuit. The original component values of the DSQ were unchanged as they are optimum, just the treatment of the output signals were messed with. This concludes my yarn of the Data Squelch revisited and I hope you will concur that with the new modification, a great circuit works even better now. Later, *Prof. Peabody.*

EDITOR'S CONCLUSION TO MOD-44B DSQ

That danged ol' Professor nagged and hounded me for several years with his dissatisfaction of my DSQ mod, and derned if I could ever clearly see what he was talking about. So I just humored him a lot to get 'im off my case.

Looks like he hit on something, though, so I will add enough meat 'n taters here so you guys don't have to refer to the WSR V1N10 or to the Ultimate Scanner book for details on the rest of the mod that remain unchanged by the Professor.

ADJUSTMENT OF VR-1: *Push the front panel SOUND SQUELCH button ON. Turn the SSQ switch OFF and the DSQ switch ON. Attach a voltmeter (-) to ground and (+) to Pin 5 of U-1. Tune the scanner to a strong, noisy data channel or to a loud, single tone carrier. (Cellular or trunked data channels are ideal!) Measure the DC voltage at Pin 5 of U-1, (4.1-4.5v typical). Calculate 80% of that voltage; then put the voltmeter at Pin 4 of U-1 and adjust VR-1 for the 80% level of the above measurement. Typically, about 3.6 to 3.8v. The exact adjustment isn't too critical, but* ***if set too low****, voice signals will resume SCAN or SEARCH. If set* ***too high****, then data & tone signals won't trigger the SCAN/SEARCH RESUME. Another way to find the optimum setting*



is to put a voltmeter (+) on Pin 2 of U-1 and (-) to ground and tune the scanner to a cellular or trunked data channel. Adjust VR-1, first one way and then the other and then to a point so that the voltage on Pin 2 of U-1 just becomes stable with a nice and steady +5 volts. It takes a steady +5 volts for about one second to trigger the SCAN/SEARCH RESUME function, but don't adjust VR-1 any further than necessary to stabilize the DATA/TONE voltage at Pin 2.

That goofy Professor says to set VR1 for +2.3v at U1-Pin 4. My tests indicate that the ***"80% Rule"*** *remains valid, but follow his direction first, and then mine, if things "aren't right". Between the two of us, we'll get you going.*

IN CASE OF DIFFICULTY

The most critical part of this mod is the rectifier circuit consisting of D-1, D-2, R-1, R-2, C-1 and C-2 and proper pin wiring of the LM-339 and 74HC00 chips. Make sure the diode polarities are correct ***(banded end is the cathode)****. Make sure polarities of capacitors are correct. Tune the scanner to a strong, obnoxious cellular (879 MHz - 881 MHz) or trunked* ***data signal*** *(851- 866 MHz), and measure the DC voltage at Pin 5 of U-1. There should be between 4 and 4.5 volts. You won't measure "too much" but too little is possible. I don't know what "too little" would be, but something could be wrong if the strong data signals don't produce at least 3v or more at U1-Pin4. VR1 always seems best setting Pin 5 to 80% of the strongest voltage on Pin 4.*

Check the wiring and components mentioned above.. Last but not least is the wiring of U1 and U2. The circuit is so simple and affirmative in its action that you're not likely to encounter trouble if you follow the diagram and these instructions.

Some PRO-2005's may have a chirping or warbling, Morse code type of sound on quiet channels after this mod has been done. If yours exhibits this weird sound, change C-1 from 1.0-uF to 0.1-uF, Radio Shack #272-1432. If the "tweet" is still there, then solder a 1000-µF capacitor (RS #272-1032) directly to Pins 4 and 11 of IC-5 in the scanner. Pin 4 should get the (+) lug of the capacitor while Pin 11 gets the (-) lug. This is a peculiar problem in some PRO-2005's, but it's easy to correct so don't worry about it.

The above photo isn't complete yet, but will be after we get your feedback.

That's it for the ***New and Improved DSQ Mod-44B****. Now let's have YOUR feedback on it so the Prof and I can debug it and finish the documentation!*

FROM THE READERS

COBRA 2000 GLT TRICKS

From: Jose Villafane, Bridgeport, CT

I would like to know what kind of tricks you did to your Cobra-2000 to stop receiving bleedover. I tried adding a second 455 filter in line with the original one, as per one of your articles in the 11 Meter Times and Journal, but it didn't work. I still have massive bleedover. Can you point me in the right direction?

ED REPLY: *What do you mean, "it didn't work"? You mean, didn't help the bleedover, or it didn't work at all? For one thing, that second 455-KHz IF filter should be of good quality, and then installed between FT-1 and R27. This will help a little. The next thing to do, and this is the biggie, replace FT-2 with a 7.8000 MHz crystal lattice filter salvaged from a junked SSB-CB rig that used 7.8 MHz in its receiver. A crystal lattice filter is very expensive if purchased outright, but dozens of old CB rigs used them, including the Midland 13-893, 895, and many others. There is a crystal lattice filter in the Cobra 2000 (FT3, but leave it alone!). That one is enclosed in heat shrink whereas most are sealed in solid metal housings. But they're all about the same size. Anyway, replacing that cheapo FT2 with a 7.8 MHz crystal lattice filter will take care of the rest of your bleedover problems. One other clue, too....replace the 3SK45 2nd Mixer FET with a 3N211 for more gain and reduced interference.*

SILVER LINED CLOUDS

Also, I would like to share something that happened to me a few weeks ago, where sadness turned into happiness. My modified PRO-62 and my Cobra 148 got stolen out of my van. Five days ago, a ham operator friend asked if I wanted to buy a scanner, that his friend got from Radio Shack. He never even put batteries in it, because he thought it was a hand transceiver. He told the guy to sell it for him. I asked him which one it was and he said it was a ***PRO-26***. He told me the guy wanted $150 and as soon as I got off the phone, I was knocking at his door. Can you believe that? A $500 scanner that just came into the market? There is justice after all!

ED REPLY: *Wow! There sure is! Thanks for sharing that with us! I'm jealous! I've been looking for a good deal on a PRO-26, myself. But I wonder why that fellow didn't take the scanner back for a refund? Radio Shack has a no-quibble return policy. Is he dumb?* ☺

PRO-43 & CELLULAR RESTORE

From: John Schleppegrell, Jr., Columbia, MD

Dear Mr. Cheek: Back before they went out of production, I bought a PRO-43 scanner as a backup to my PRO-2006. I would like to know if you still do modifications to the PRO-43. I'm especially interested in getting the cellular freqs restored, as well as VHF low (54-88 MHz). If you do still work on the PRO-43, I'd appreciate it very much if you would let me know the price as well as shipping instructions so I could send mine to you. Also, if you do any other mods (I remember there was discussion of an LED signal strength meter among others), I'd sure like to hear about what's available. Thanks for your time.

ED REPLY: *I am doing some bench work again but send e-mail or call our voice line for a quote and business talk. It is possible to install an LED S-meter in the PRO-43 though space is tight and small LEDs have to be used. I will look into that for you and our readers.*

CELLULAR Rx POSSIBILITIES

From: Albert Smith, Brooksville, FL

I recently wrote to you regarding restoring cellular to my PRO-43. Thank you for the prompt answer, altho it was not what I had hoped for. My PRO-43 indeed has an "A" in the serial number. My way of thinking is for every action there is a reaction. Since the company acted by deleting cellular, the public reaction should be able to restore it.

It would seem that someone would be able to come up with the proper procedure to restore cellular to a PRO-43A. How about you; will you have a restore procedure for the PRO-43A? Or could you inform me of who might perform the restoration of my PRO-43A?

I called Grove Enterprises to order a CVR2 converter and was told they were discontinued. Would you know who has an 800 - 1000MHz converter?

ED REPLY: *The TDDRA of 1984 is a law passed by Congress that forbids scanners to be easily modifiable for cellular reception. Manufacturers responded by making it* ***impossible*** *to receive cellular. That was the easiest way to comply. All they had to do was delete the part of the CPU firmware (program) that lets the scanner tune the cellular frequencies. In the past, that code was there, and then programmed to be inactive by an external diode. Clip the diode and cellular was available. But now the code is not there, so there's no way to access the cellular bands by any conventional means. See V5N9 for a source of regular PRO-43's, in case you can find a way to sell your PRO-43A, but you better hurry; supplies are limited.*

There ***may*** *be a hokey or kludgey means of* ***forcing*** *a scanner to receive cellular, but I am not fully aware of the method yet, and what I understand so far is that such procedures could reduce the performance of the scanner in all other modes. For more information from the people who do this method, contact:*

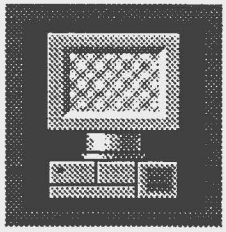
Cellular Security Group; 47 Causeway St; Gloucester, MA 01930 (508) 281-8892

Last, but not least, that same TTDRA of 1994 also forbids "converters" and other external electronic means of letting scanners receive cellular, so there are no more converters on the market for that capability. You could look for a used model, though.

HOMEBREW COMPUTER NOTES

From: Tony Thornton, Mize, MS

Hi Bill & Cindy: I think an in-depth series on computer building and upgrading in the WSR is a good idea, the M/T articles are good also. The reason I'm writing is that I've recently read in a computer mag or two, that a couple or more of the big manufacturers have started making their motherboards, power supplies, etc., odd sizes so that only replacement parts are available from them. Compaq and Packard Bell were two of the companies named with the possibility that others might follow. Damned if I want to pay Packard Bell or Compaq a hundred dollars or more for a $20 - $30 power supply. I think people that are in the market for a new computer should be made aware of this so they can look to other brands such as Zeos, Gateway, etc. that have standard size components. Or even better yet, follow your articles and build their own, they only have the drives, etc., in it that they want, not something that a mfg. bought a jillion of them for $50 ea. Well, that's my two cents worth.



ED REPLY: *You hit on an excellent point about computers. Indeed, certain manufacturers deviate from "standards" so as to force the customer to stick to the "brand". Compaq and Packard Bell are famous for that skullduggery. Packard Bell prices are so low that many people are attracted without giving a thought to future add-ons and upgrades.*

It never occurred to me to put it this way before, but just as we hardcore scannists buy our radios with the idea of add-ons and upgrades, so too, should be buy our computers with that same idea in mind.

Truly, this is the time to build your own computer around a 486 CPU because the cost of the motherboard and CPU are ridiculously low priced, as are the add-on cards. In that sense, it doesn't matter if you have an older 386 Compaq or Packard Bell, because you can junk the motherboard and power supply and still come out. In fact, a case and power supply costs as low as $45, and a hot 486DX4/100 chip & motherboard are running under $200 now. Add to that $200 for a 540-Mb hard drive and controller; $90 for a good video card; $30 for a high speed serial/comm card, and it is conceivable you could be in business for well under $600 and a lot less than that if you already have a hard drive and video card.

Provided I don't get a lot of negative feedback, I plan to run an article or two on "rolling your own computer" soon.

PRO-2004 PROBLEM SOLVED!

From: Keith Estey, Canada: I wrote to you 4 years ago about a problem I had with my Realistic PRO-2004 scanner after doing the speed modification from your ***Scanner Modification Handbook***, Vol-1. Every 4 channels were duplicated, every two search banks were the same, you could not enter frequencies in some channels, frequencies would change in some channels, direct search would not work, etc. No one seemed to know what was the cause.

Although I am always careful when soldering, I checked the circuit board over several times looking for solder bridges, open circuits, parts touching, etc. I replaced the CPU and all other IC's on the CPU board and the 9 volt battery regulator, all to no avail.

I was tempted many times to buy another scanner but didn't. This summer I finally decided I would get a new one the next time they put them on sale but I thought I would have one more look at my 2004, and after more checking for open circuits I found one, -I think it was between pin 4 on IC504 and pin 52 of the CPU. As you know, this is a double-sided board and where the lead of one of the diodes (diode 514?) goes through the board is where the circuit on one side connects to the circuit on the other side and for some reason the connecting foil - IN THE HOLE - broke, causing the open circuit. The body of the diode was next to the hole, making it difficult to check continuity at that point, so I replaced the diode putting the longer lead in the hole then soldered it to the circuit on both sides of the board. I turned the scanner on and away it went, working perfectly.

Why the circuit foil broke where it did. I'll never know as the lead of the diode is small enough to FALL through the hole. Perhaps the foil was cracked and the lead caught on it? I don't know. Anyway, it was quite a puzzle but finally solved!

I now have a 400-ch scanner with higher speed scan and search, cellular phone band, and I have since added the analog S-Meter and it all works great!

I thought I would let you know what did happen in case someone else runs into a similar problem, and also, you might want to warn other hackers that if they run into any problems to be sure to check those connections where the circuit goes from one side of the board to the other. It can cause some strange things to happen and be quite frustrating.

ED REPLY: *What a find! Way to go! We have long known of a defective wave soldering machine at the factory that produced hundreds, maybe thousands of PRO-2004's with defective solder joints, many of which escaped QA and even managed to not show up through the warranty period. Apparently the wave soldering machine drifted out of tolerance over a period of time, because some 2004's failed during warranty; some right after warranty expired, and to this day, some are still failing. In these cases, a lot of resoldering gets the unit back up and running.*

I have heard of defective "vias" or plated-thru holes, but haven't seen any myself. Apparently yours was almost defective, but not quite, until you poked that speedup diode into the hole. Perhaps the heat of soldering made it fail. Hard to tell now. I just wonder what would have happened had you resoldered that connection several years ago? I'm pretty sure I advised you then to look for bad solder joints, though this would not have clued you to anything you did or that was associated with the speed diode modification. So from your anecdote, we can resurrect an old technician's rule of thumb:

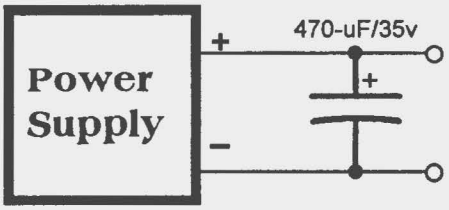
> If your equipment was functioning ok before you went into it, and has a failure mode after you're done, then trace & retrace your steps until the problem is found, and do not go off on tangents and unrelated avenues of pursuit!

I wish I would have insisted on that axiom back when you and I corresponded, and I wish you would have persisted with questioning me until we found the problem. All's well that ends well, but geez, man, you sure had to do without a superb scanner all these years. Let this be a lesson to the rest of us to persist until we meet success!

POWER SUPPLY HUM

From: Thomas Nichols, Indianapolis, IN
The A/C-D/C power supply from MECI has a hum in it. How do we get rid of it? Keep up the fine work. How about a book or more info on the BC-3000?

ED REPLY: *Depends on what kind of "hum" we're talking about, mechanical or electrical. Mechanical hum is a physically generated sound, usually from the transformer core, while electrical hum is caused by an unfiltered DC or insufficient filtering of the DC supply circuit. Usually there is no cure for mechanical hum unless nuts & bolts can be tightened to quench the vibration that causes the hum. Electrical hum can usually be corrected by adding a large electrolytic capacitor to the (+) and (-) leads of the power supply as follows.*



Start with a capacitor value of 470-µF, and if that helps at all, but doesn't eliminate the hum, then try 1000-µF, doubling the value each time until the hum is gone. Usually 470-µF- 1000-µF will eliminate electrical hum. Electrical hum comes from the speaker of the equipment whereas mechanical hum comes from elsewhere, usually a poorly designed transformer, or a defective one with loose laminated plates. Time for a new power supply, maybe?

BC-3000XLT vs PRO-26?

Good thought on the BC-3000 except that you're the first person to ask about it. I don't have any solid technical information on it, but Steve Donnell of the US Scanner News says it's strikingly similar to the PRO-26 that we have covered and will continue to cover. You should acquire the service manual for the BC-3000 from Uniden Customer Service (317) 842-1036. If I can borrow it from you to make a super-clean copy, I'll be glad to do a comparison and to account for the differences between it and the PRO-26 in future articles.

The PRO-26 is also made by Uniden and apparently differs from the BC-3000 only to a minor extent. Weird, because the retail price of the BC-3000 is $350 whereas the PRO-26 is $100 more. For being about the same radio, that's a lot of difference, but then maybe Uniden is slipping the royal shaft to Radio Shack? Let me borrow your service manual on it and we'll go whole hog and see what can be done to that puppy.

CONTROL OF FIRMWARE?

From: Mike Kionka, Arvada, CO: It's time to renew my subscription to the WSR. It's a great info source, so keep it coming! I've done a lot of experimenting with scanners, 2-way radios, and computers since I last wrote to you. I received my ham license last October, and have found it's just as much fun to talk, as well as listen in on my scanners!

ED: *Way to go! Just remember that you can't learn anything whilst you're talking. Listening is learning!* ☺

Since my radio and electronic horizons are rapidly expanding beyond scanners, I don't mind if the WSR has information on computers and other general electronics, as well as the scanner info. I think the Super Snoop Transmitter looks like a fun project, and I eventually plan to build it! My latest project is adapting an S-Meter to a Motorola GM300 two way radio. This radio has many interesting features, and I've had a great time experimenting with it!

This radio is good old "firmware" controlled by a Motorola 68HC11E9 microcomputer (sorta like what's in the CE-232). What's radically different about this firmware radio compared to most firmware scanners is that this firmware is much more controllable. The radio is programmed by a standard IBM PC through a COM port. I can change and modify everything from the scan delay to operating freqs to the Tx power output without even opening the radio! This shows that firmware doesn't always have to stop a hacker!

ED: *True, except that in scanners, the firmware is deliberately inaccessible.*

The service manual says the MPU's operating program is stored in an EPROM, so I would think that a hacker with the right equipment and programming knowledge could make this radio do almost anything. Scanners are using more firmware, so hopefully mfgrs will make theirs somewhat controllable as it is in this radio, but this is probably too much to ask.

FLICKERING LED S-METER FIX

On a different subject, the digital S-Meter in my PRO-2006 worked great, but it would flicker constantly when scanning. I figured the easiest way to fix this would be to only power the meter circuit when the squelch was open. To do this, I simply put your Carrier on Indicator circuit in the power line for the meter. It works great, and I haven't had any problems! You might want to pass this on to the readers!

ED: *Done! I think this or similar fixes have been introduced in the past, but it remains a common complaint.*

CE-232 DAYDREAMS & REALITIES

I greatly enjoyed your **Ultimate Scanner** book, and the CE-232 looks like an awesome accessory, but since the family computer is downstairs and my scanner is upstairs, it wouldn't be practical at this time. Oh well, maybe in a few years things will change!

ED: *Our dear Professor Peabody had a situation similar to yours, so he used an external speaker & volume control next to the computer with the wire and the necessary serial cable running upstairs to the CE-232 and the scanner!*

Another solution, of course, is to get a second computer, perhaps one just for the CE-232, and as such, can be an old cheapo XT or AT/clone costing as little as $100. You can't give those darned things away anymore, but they'll work just fine for the CE-232, offering total scanner control from a remote location without any sacrifice. The CE-232 requires only MS-DOS 3.1 or higher with 512-k RAM (min) and a 5½" floppy drive. Hard drive not mandatory, but ideal with about 3-Mb of free space. Any old junk PC/compatible will do.

QUICK FIX FOR A WARM SCANNER

From: Bill Koepp, Bakersfield, CA: After running my PRO-2036 (This would also apply to the BC-890, and probably the BC-8500 & BC-9000) for quite a while, I noticed that the cabinet was very warm, even though the unit uses a wall transformer. I found the source to be the IC-7, an L78MO5CV - 5 volt regulator, located beneath the speaker. The IC is heat sunk to the chassis, but still puts out a lot of heat.

There were three solutions; I could drill holes in the cabinet top, or I could remove the speaker, allowing the heat to escape through the speaker grill and use an external speaker, or, (my choice) remove the stock speaker bolts, replace with longer bolts and ½ " long spacers, dropping the speaker a half inch to allow the warm air to flow out. It worked!

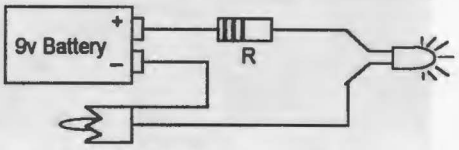
PLUG-IN CARRIER ON INDICATOR

A Carrier-On-Indicator (COI) is really neat, and if your scanner can control a tape recorder, it might also be able to switch an LED to indicate active channels. Scanners like the PRO-2036, BC-890, BC-8500 and BC-9000, to name a few, have an RCA phono jack on the rear panel, which is controlled by a front panel button, marked "AUX."

If you don't want to dig into the guts of your scanner, to build in the usual type of COI, a plug-in unit has some advantages; it's cheap, it's easy, and can be unplugged when not wanted.

I used a large green LED (Radio Shack #276-215), a 9 volt battery, stepped down with a 330 Ohm, ¼ watt resistor (#271-1315), and a small box such as RS #270-211. You'll need an RCA phono plug and a piece of lamp cord, or remove one end of a store-bought audio cable, for a nicer appearance.

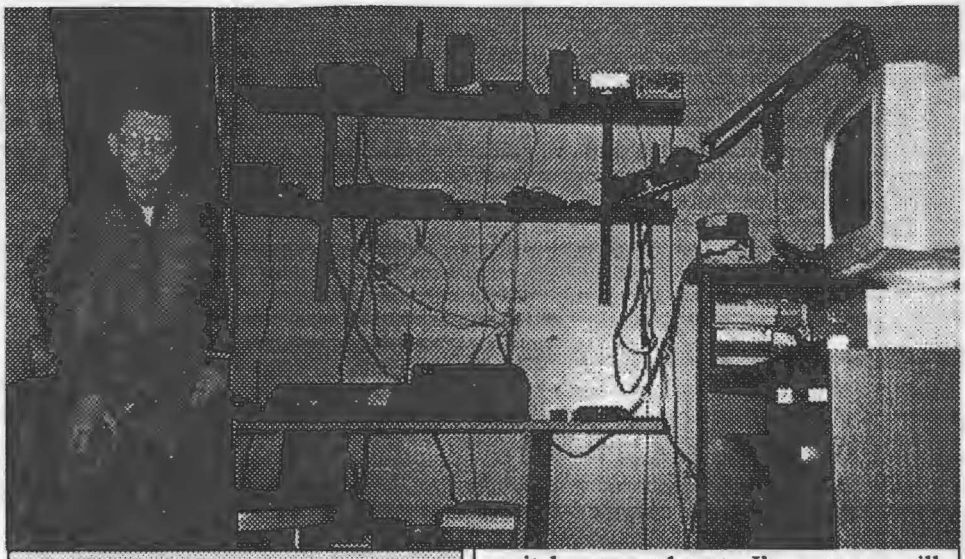
LED 276-215 Box 270-211
Resistor 271-1315 (1) Cord W/Phono plug



ED NOTE: *The battery will last three times longer if R = 1000Ω The brilliance will not be adversely affected!*

Install the LED with the anode (longer lead) connected to (+). If unsure that your scanner actually has a switching relay, check first, before you start assembling anything. An ohmmeter will show if a relay is closing, just be sure that you have activated the "AUX" control, if there is one.

The plug-in COI can be sticky taped to the top of the scanner, or placed higher on the wall, for better visibility, or just left to sit on the bench. After using the COI for some time, I found that each channel has to be set with the AUX button, after which the COI works great. The relay may or may not close in the search mode, depending on the model being used.



HANDHELD SCANNER TIP

From: William Shaft, Tinley Park, IL

I have only started learning my computer since April of this year and figure it will take another six months to get it down pat, again, patience is the key word.

Sometimes I like to listen to my PRO-34 where it's dark; I memorized the tiny buttons but I found a SEARCH button for 800 MHz & up. I learned you don't have to hit the ↑ or ↓ buttons to get it to continue searching; all you have to do is wrap your hand around the whip and it moves on.

CE-232 & PRO-2035/2042 NOTES

I have, for the most part, completed the CE-232 interface. I'm still looking for a 2005/6 to install it in. If worse comes to worse I'm still thinking about using that PRO-2035 to interface. Is the 2035 such a dog; should I trade it, sell it, or what? All I did so far is the improved tape rec switch, easy and neat. I'm sure you will have a comparison of the 2035 and the 2042. They look the same outside and my guess is just a different microprocessor. Best Wishes

PS. I built the Super-Snoop and found it's cheaper to buy mini amp 277-1008c than build that amp and meter. Keep, throw away, or use the photos I sent.

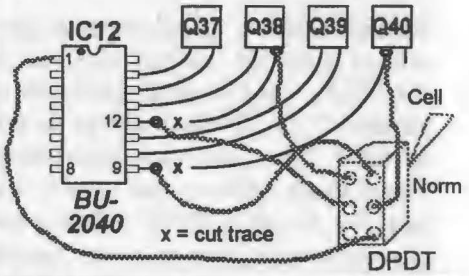
ED REPLY: *Good tip on the PRO-34 quick-resume technique. Apparently your hand absorbs enough signal to drop it below Squelch Break level.*

*The PRO-2035 certainly can be interfaced to the CE-232 for 1-way Keyboard control & **AutoProgramming**, but what I want to know is why don't you connect it to that PRO-2004 I see in your photo! You'll get 2-way control & data acquisition with the PRO-2004.*

*I don't see the 2035 as a "dog" at all, but it did get some hardware cutbacks at the trade-off of a bit of enhanced firmware and 1000-channels. You know me, I'm not a firmware fan; **not at the expense of hardware.** Firmware is software. Software solutions to hardware problems are a gross misapplication of technology. The heck of it is that you're not going to do much better with any scanner in the foreseeable future. The mfgrs of scanners have seen the profits in a "cute" case with lots of cheap firmware features. They're not going to change. This is why I see such great value in the PRO-2004, PRO-2005, PRO-2006 and PRO-43 for a long time to come still!*

LATE BREAKING NEWS
CELLULAR MODS FOR PRO-2035 & PRO-2042

The Feb-96 issue of *"Monitoring Times"* features a detailed article by Steve Donnell on how to extract cellular reception from the PRO-2035/2042 scanners. Bear in mind that cellular reception by conventional means remains **impossible** on these scanners, but Donnell found a hack to :"trick" the PLL into tuning cellular on the 128.5-140.5 MHz band segment. Here's how for you experienced hackers who don't need much to go on. Details in next issue for the rest of you.



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